

Professor Dyce.
With the Compt. of the Act.

OBSERVATIONS

ON SOME

LOCAL ANÆSTHETICS.

BY

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LOCAL ANÆSTHETICS.

SOME remarks made by Dr Bennett in a clinical lecture the other day, with regard to the employment of chloroform as a local anæsthetic, excited some discussion amongst the clinical clerks. The evidence brought forward at the close of the lecture being of an unsatisfactory nature, we were induced to institute some experiments, with a view to satisfy ourselves as to the real merits of chloroform when employed as a topical anæsthetic. In carrying out these experiments we were actuated only by the desire to arrive at truth, having no preconceived theories to bias our investigations.

Having laid our conclusions before Dr Bennett, who examined them and alluded to the subject in another lecture, we proposed to bring before this Society the results of our experiments, with a view to their further elucidation through the medium of discussion, and in the hope of obtaining additional information, by awakening an interest in the minds of our members.

The title of our communication shows that we have been engaged only upon *some* local anæsthetics, for, of course, there are many agents of this nature. We may, then, briefly state that our investigations have been confined to chloroform in liquid and vapour, ammonia in liquid and vapour likewise, to chloroform and acetic acid according to the new French form of chloracetisation, and, lastly, to freezing mixtures.

We purpose in the first place, considering the subject in a *physiological* manner, and in the second to adduce the results of *pathological* inquiry.

It has frequently been argued that the word "*anæsthetic*" is inapplicable and untrue with regard to chloroform; for our own part we could never value the force of the argument used against its employment, neither shall we recognise its validity. In a lecture delivered by Professor Bennett last week in the Royal Infirmary, he based his argument against the correctness of the applicability of the word "*anæsthetic*" to chloroform on the following grounds:—"Looking at the meaning of the word *anæsthesia*, I find it implies a want of feeling, hence as chloroform destroys the sense of touch by first producing loss of consciousness, the term *anæsthesia* is inapplicable, and is only employed as a mask to conceal its true action as a stupifying agent." These views are also expressed at page 432 in his work on the "*Principles and Practice of Medicine*," where he characterizes the present use of the term as erroneous and unscientific.

In opposition to Dr Bennett's argument, we maintain that the Greek verb *αἰσθάνομαι*, means in its strict and true classical sense, "*I perceive with the senses*;" that the cognate ~~substantive~~^{substantive} *αἴσθησις*, implies "*perception by the senses*;" and the word *ἀναισθησία* itself, means "*stupidity*," with its corresponding verb *ἀναισθέω*, "*to be*

senseless or stupid." The misunderstanding of the true and comprehensive meaning of the verb *αἰσθανόμαι*, has evidently, we apprehend, induced Professor Bennett to object to the use of the word *anæsthetic* when applied to chloroform; but throughout the present paper we shall use the term *anæsthetic* in its correct and ordinary acceptation. Professor Simpson informs us that, so far from the term *anæsthesia* being a new one in medicine, it was employed by Dioscorides 1200 years ago, and hence its present employment by the profession.

1. *Observations on the Local Physiological Effects of Chloroform and its Vapour.*

EXPERIMENT 1.—Vapour. We applied the vapour to our arms in test tubes for periods of ten and fifteen minutes. In about three minutes a feeling of coldness was experienced in the parts operated upon, the skin becoming reddened. This sensation merged into one of slight irritation, but never amounted to pain. In from ten to fifteen minutes, on pricking the arm, sensibility was decidedly diminished, though not abrogated. Subsequently no local signs of irritation remained.

EXPERIMENT 2.—Topical application of Chloroform in the form of liquid. We applied chloroform on lint, and in test tubes, to the backs of our hands and arms for periods varying from ten to thirteen minutes. Very soon an irritative action commenced in the part, gradually increasing and becoming slightly painful for about seven minutes, when the pain began to diminish, and a sense of heat remained in the part, with well-marked redness. On pricking the arm in one case, it was found totally insensible to the stimulus for the space of half a minute, after which sensibility gradually returned. In the other case, total *anæsthesia* was not produced,—the application, however, being maintained for ten minutes only. The sensibility was nevertheless greatly diminished. In both cases persistent redness remains, the line of pressure being especially well-marked, and the parts continue super-sensitive if touched.

2. *Application of Ammonia in Vapour and Liquid.*

Vapour.—Mr Davy applied the vapour of the liquor ammoniæ fortissimus to the back of his arm for ten minutes; very slight tingling ensued. No *anæsthesia* nor signs of irritation.

Liquid.—He next applied a mixture of equal parts of liquor ammoniæ fortissimus and water to the flexor surface of his forearm in a wide test-tube for ten minutes. Irritation commenced immediately, and increased gradually up to the time of removal, when perfect *anæsthesia* resulted. This, as in the case of liquid chloroform, quickly disappeared. The cuticle was found to be detached from the cutis vera. Irritation continued at the part for ten days afterwards.

3. *Chloracetisation.*

Our attention has been directed within the last few days to a new mode of producing *anæsthesia*. It was introduced by M. Fournié, who communicated his results to the French Academy not

very long ago. He announces that the most perfect anaesthesia can be produced by mixing equal parts of chloroform and glacial acetic acid in a vessel, filling it half-full, maintaining the mixture at the temperature of the hand, and the room in which the experiment is performed at a temperature of 62° Fahr. The mixture is to be applied to the sound skin ; the part to be acted on being marked off by a piece of diachylon plaster. In five minutes, under these circumstances, total anaesthesia is to be looked for. Upon the rapidity of its action, and the slight inconveniences occasioned thereby, are based the merits of this method. We were much interested in reading M. Fournié's announcement, and determined to give it a fair trial. We therefore complied with all his directions, and proceeded to try chloracetisation. Two drachms of glacial acetic acid and a drachm and a half of chloroform were put into an ounce test-tube, warmed to the heat of the hand, and then applied to the skin of the forearm. In from ten to fifteen seconds, the most intense and violent smarting commenced in the part, increasing to such a degree that it was *perfectly insufferable*, and we were instantly compelled to apply active cold douching to the parts. The pain was excruciating ; the cuticle was uplifted, and the surrounding parts deeply reddened. Some drops which escaped from the tube, lighting on the forehead of one of us, caused most violent pain. The smarting continued severe afterwards, and the parts assumed the appearance of urticaria. The pain was of a stinging character, intense and prolonged like that of nettles. This was due evidently to the presence of acetic acid, which produces symptoms quite analogous to its homologue, formic acid, an irritating ingredient in the glands at the base of the hairs in various species of stinging urticarias. Chloroform assists the action of the acetic acid, severe enough in itself, by favouring its absorption ; and we know that a solution of extract of belladonna in chloroform acts with tenfold greater rapidity than an ordinary one. On the whole, then, we have no reason to be pleased with chloracetisation. In the course of the white mark produced no pain was felt ; this white mark differs from the white form of inflammation (due to capillary paralysis), in being caused by the raised cuticle. When deep pressure was made, acute pain was felt. We cannot conceive it possible for the mixture to be tolerated for five minutes on any part, as M. Fournié directs ; our mutilated arms still bear testimony to its severity.

Generalizations.—As to the physiological actions of these various articles, we are inclined to the belief that they do not produce their effects till an action, amounting to one of revulsion or counter-irritation is brought about ; or in other words, that their anaesthetic effects are due, and contemporaneous in a measure, with a counter-irritative action, since a varying amount of irritation in all cases precedes the anaesthesia. We mean by counter-irritation the production upon the surface of a powerful impression, which seems to be capable of arresting and diverting, as it were, the attention of the system, and thus for a time checking or relieving a morbid process.

Also, in the case of the human subject, we believe the local application of chloroform *in vapour* to possess the feeblest anaesthetic powers. *In the form of liquid* the effects, though transient, are much more strongly marked. The same remarks apply also to the liquor ammoniæ, excepting that the results obtained from *its vapour* were negative.

4. *Observations on the Local Effects of Chloroform in the Treatment of Disease.*

Pain.—With reference to the cases in which we may expect local anaesthesia to be beneficial, we may here observe that there are different kinds of pain; and Dr Headland very ably divides them as follows:—

First, Inflammatory pain from active disease. This is aggravated by pressure, and has a local cause.

Secondly, Irritative pain. This depends on nervous irritation, has a local origin, but is often relieved by pressure or friction. *Neuralgia* is a pain of this kind; so is the pain inflicted by the knife; that produced by lead colic, gall stone, renal calculus, etc. This, then, is the only kind of pain which we may hope to benefit by local anaesthetics.

Thirdly, Pain that is reflex in its origin, *e.g.* the pain in the knee in hip-joint disease. We can do no good here with anaesthetics of a local kind.

Fourthly, Centric. This does not originate in the painful part, but in the brain or nervous centres; such are the pains of hysteria. Local anaesthetics are useless in these cases, and we must combat the central disorder.

EXPERIMENT 1.—*Action of the vapour of chloroform in a case of frontal neuralgia.* We applied the vapour of chloroform locally, by means of lint soaked in the fluid, and placed in the bottom of an inverted wine-glass. At the close of its application, which was continued for ten minutes, the patient's severe neuralgia was completely relieved; the common sensibility of the part was not in the slightest degree diminished. No local signs of irritation were produced, and its application was unattended with pain.

EXPERIMENT 2.—In the same case, on another occasion, we applied the liquid chloroform locally for ten minutes; the neuralgia was completely removed, but in addition, local irritation and diminished common sensibility resulted, as in our own experiments.

EXPERIMENT 3.—We applied a solution of equal parts of liquor ammoniæ fortior and water to the same case of frontal neuralgia locally, by means of lint in a bell-glass for ten minutes.

A sense of irritation, tingling, and heat, were experienced in about a minute after its application. Little or no relief was obtained, and the ordinary sensibility of the part was but very slightly impaired. This patient (who is a very intelligent woman) states that she has obtained the *most marked relief* from the local application of liquid chloroform, which she thinks far superior to Fleming's tincture of aconite. On looking over our clinical notes for the present session, we find that chloroform has been locally

applied as a therapeutic agent in five cases of neuralgia occurring in females, and in every case great relief has been afforded. We would further call attention to the fact in practical medicine, that the local application of chloroform and its vapour abrogates a neuralgia, while the normal sensibility is unaffected.

Professor Simpson mentioned to us that he had frequently made use of the vapour of chloroform to allay the extremely harrassing pain attendant upon carcinoma uteri; the remedy very often answered its purpose well, but could not, however, be implicitly relied upon, for its beneficial influence was found to be irregular; the reason of this has not yet been explained. Professor Simpson also bore testimony to the very good results obtained by the local application of carbonic acid in vapour to painful or ulcerated parts; and mentioned the desideratum, which yet exists, of obtaining carbonic acid in a solid form, capable of passing into vapour.

5. Ice as a Local Anæsthetic, introduced into Practice by Dr J. Arnott.

CASE 1. Patient admitted into Guy's Hospital, suffering from housemaids' knee. During her stay in the ward she fell; the bursa patellæ became acutely inflamed, tension increased, with throbbing, and pus had evidently formed in its cavity. A mixture of crushed ice and salt, in the proportion of two parts of the former to one of the latter, was accurately applied over the bursa, and maintained in that position for ten minutes. The skin became white, *but not painful*; assumed very much the appearance of bacon, and felt exceedingly indurated. The girl was very nervous, and covered her face apprehensively. Mr Davy (dresser to the case) made a free opening with the bistoury; and on his telling the patient that the necessary operation was over, she was much surprised and delighted, having experienced neither inconvenience from the application of the freezing mixture, nor pain from the incision.

CASE 2. Woman admitted into Guy's Hospital, suffering from strangulated femoral hernia, but without any urgent symptoms. Ice and salt mixture (as before) was locally applied over the tumour, and maintained for twenty-four hours. During this interval the usual unfavourable symptoms of strangulation occurred, and the taxis failing, the operation for reduction was at once proceeded with (no chloroform was given); Gimbernat's ligament was divided, the bowel returned, and a suture introduced. The necessary manipulations did not give the patient any pain whatever, and she made an excellent and rapid recovery.

CASE 3. Mr Duckworth had a condensed fatty tumour on the inner side of the left thigh. He determined to have it removed, and the operation was put into the hands of Mr Hakes of Liverpool. It was decided that a freezing mixture should be employed, before making the necessary incision and dissection. A lump of ice was placed on a board, and finely crushed under a glass roller. Four parts of this were stirred with the same quantity of common salt, and the whole (about two ounces) was put into a cambric handkerchief, and applied over the tumour, and for a radius of three inches around. At first a feeling of cold ensued, followed by

smarting and redness of the surface. The latter symptom, however, was traceable to an excess of salt in the mixture, and some more ice was added, which caused much more efficient action, and removed the smarting. The mixture was squeezed into a flat cake about three-fourths of an inch in depth. In five minutes sensibility was diminished, in ten it was almost abrogated. It was kept closely applied for fifteen minutes, when *the most perfect anæsthesia* was produced. No pain nor disagreeable sensation accompanied the application of the mixture. This is worthy of note, since it is generally alleged that the freezing of a part causes more severe pain than the subsequent operation which may have to be performed. An incision $1\frac{1}{4}$ inch long was made by transfixion, through the substance of the tumour down to the fascia lata. Half of the tumour leaped out; the remaining portion was dissected away with the bistoury and forceps, and some of the surrounding texture was likewise removed. Not the slightest sensation occurred, and it seemed magical to be assisting deliberately at the cutting of one's own flesh. Scarcely twenty drops of blood were lost. The edges of the incision were brought together by one suture, which, after the lapse of five minutes, *caused not the slightest sensation*. The wound healed very well, and no subsequent reaction nor trouble ensued. Certainly nothing could have been more successful than this; and the boon of being freed from the horrors of cold steel was considered no small one in this instance. It becomes a question, therefore, whether employment should not be more frequently made of freezing mixtures, prior to *superficial operations* in surgery. Of course it can only be expected to act in superficial cases. In private practice it is especially a desideratum to abrogate pain, even in the minor operations; and in many of these the employment of chloroform by inhalation is hardly called for, or indeed warranted, since we find that statistics show a greater mortality to occur from the use of chloroform under these circumstances. We may here instance some operations which might be painlessly performed by this method:—

1. The operation for *onyxis*; the toe being surrounded by the mixture till anæsthesia be produced.
2. The removal of small superficial tumours. This division is a very comprehensive one, embracing the removal of malignant, cystic, benignant, and other growths.
3. The opening of abscesses; both acute and chronic when superficial; including anthrax and furunculi.
4. The operation for *paraphymosis*.
5. The operation for femoral hernia; it being a common practice to apply ice locally to facilitate the taxis.

In such cases we consider *ice* to be without doubt the most valuable form of local anæsthetic, from its admitting of simple application combined with the most satisfactory results.